DOCUMENT RESUME

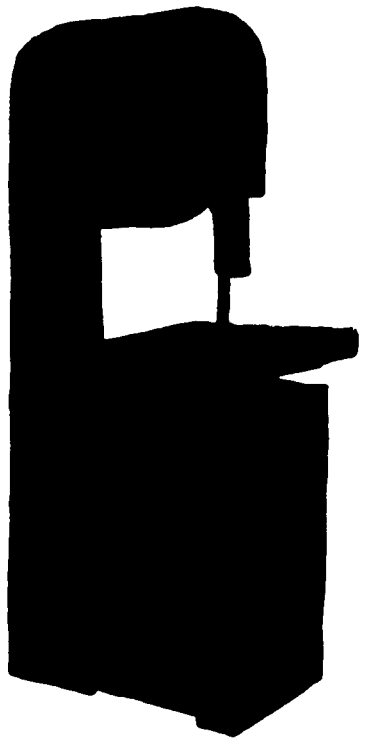
ED 036 138 EF 004 095

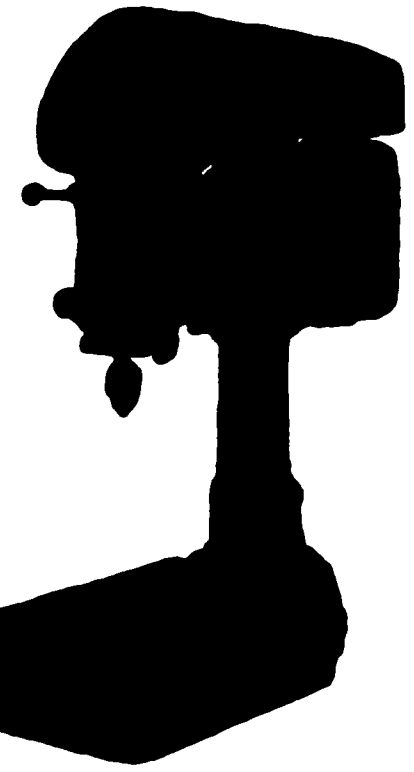
TITLE PLANNING AND EQUIPPING INDUSTRIAL ARTS FACILITIES.
INSTITUTION MAINE STATE DEPT. OF EDUCATION, AUGUSTA. BUREAU OF VOCATIONAL EDUCATION.
PUB DATE 66
NOTE 55P.

EDRS PRICE EDRS PRICE MF-$0.25 HC-$2.85
DESCRIPTORS BUILDING EQUIPMENT, BUILDING MATERIALS, BUILDING PLANS, CLASSROOM ARRANGEMENT, *EDUCATIONAL PROGRAMS, ENVIRONMENTAL INFLUENCES, EQUIPMENT, EXHAUSTING, *FACILITY GUIDELINES, FLOORING, *HIGH SCHOOLS, *INDUSTRIAL ARTS, LIGHTING, *PERFORMANCE CRITERIA, PLANNING, PLUMBING, SCHOOL SHOPS, SPACE CLASSIFICATION, SPACE UTILIZATION, UTILITIES, VENTILATION

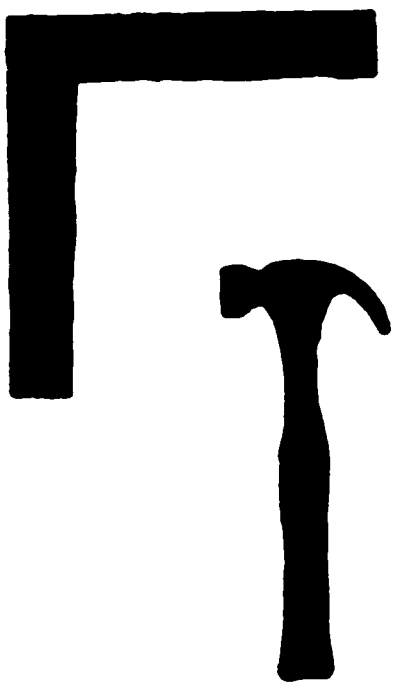
ABSTRACT

ARCHITECTURAL DETAILS, PLANNING, AND FACILITY GUIDELINES FOR INDUSTRIAL ARTS FACILITIES ARE GIVEN, WITH DATA ON PLANNING THE NUMBER, SHAPE, SIZE, AND LOCATION OF SCHOOL SHOPS. INDUSTRIAL ART PROGRAMING AND PERFORMANCE CRITERIA FOR VARYING LEVELS OF EDUCATION ARE DISCUSSED WITH REGARD FOR THE DIFFERENT SHOP CURRICULUMS. THE FACILITY PLANNING IS CONCERNED WITH FLOORING, CEILINGS, PARTITIONS, WALLS, POWER, STORAGE, PLUMBING, AND ENVIRONMENTAL CONTROLS. SPACE REQUIREMENTS FOR VARYING GLASS SIZES ARE GIVEN ALONG WITH AN EQUIPMENT CHECK LIST. DRAWINGS AND AN APPENDIX ARE INCLUDED. (TG)





Planning and Equipping Industrial Arts Facilities



State Department of Education
Division of Vocational Education
Augusta, Maine

Forward

Planning and Equipping Industrial Arts Facilities, is prepared as a guide to be used by educational teams and architects engaged in planning and designing secondary school facilities.

The recommendations contained in this guide are intended to be used as references in the study of problems arising when formulating specifications for any given facility.

This guide was made possible by the efforts of the following people:

Harold Sanborn, Fryeburg Academy

Ronald Edwards, King Junior High School, Portland

John Greer, Associate Professor, Gorham State College

Elwood A. Padham, State Director of Industrial Arts Education

Arthur Berry, Associate Professor, Gorham State College

Industrial Arts Department, Lisbon High School, Lisbon Falls

"Planning and Equipping Industrial Arts Facilities"

INDUSTRIAL ARTS

Industrial arts is that phase of general education which offers individuals an insight into our industrial society through laboratory-classroom experiences. Through the study of industrial arts the role of industry and technology is unfolded. Students study the history, growth, and development of industrial organizations, materials, products, processes, and related problems. The complexity of the age in which we live is the result of industrial-scientific inventions and innovations. Industrial arts emphasizes problem-solving experiences which assist students in becoming alert contributors and consumers.

Technology and industry continuously influence our way of life. Through industrial arts a learner develops an awareness and appreciation of the tools, materials, and processes involved in the past and present methods of production. It provides experiences in developing basic skills and knowledge common to many occupations and professions. Industrial arts provides a means by which students can apply in practical and meaningful situations the theoretical principles of science, mathematics, and other related subjects.

OBJECTIVES OF INDUSTRIAL ARTS

Industrial arts education is designed specifically to help prepare individuals to meet the requirements of an industrial-technological culture. The following four statements of purpose are unique to industrial arts education.

1. TO DEVELOP IN EACH STUDENT AN INSIGHT AND UNDERSTANDING OF INDUSTRY AND ITS PLACE IN OUR SOCIETY. Since industry is a constructive, dynamic force in the world today, it is the responsibility of the school to provide opportunities for each student to understand this force better. Industrial arts provides significant learning experiences relating to industry in which students acquire skill in performance and knowledge of principles and theory through study and application.

2. TO DISCOVER AND DEVELOP STUDENT TALENTS IN INDUSTRIAL-TECHNICAL FIELDS. Students have a diversity of talents. The school's responsibility is to assist students in discovering and developing these talents. It is the responsibility of industrial arts education to identify special talents in industrial-technical fields.

3. TO DEVELOP PROBLEM-SOLVING ABILITIES RELATED TO THE MATERIALS, PROCESSES, AND PRODUCTS OF INDUSTRY. The problem-solving approach in industrial arts involves creative thinking, and gives the student opportunity to apply principles of planning and design, construction techniques, industrial processes, scientific principles, and mathematical computations to the solution of the problems.

4. TO DEVELOP IN EACH STUDENT SKILL IN THE SAFE USE OF TOOLS AND MACHINES. Industrial arts provides planning, construction, and production activities which enable students to acquire industrial-technical skills. These activities offer opportunities to develop tool and machine skills commensurate with the mental and physical maturity of the student.

While these four objectives are considered basic for industrial arts, supplementary objectives may be developed for elementary school, junior high school, high school, and adult programs, as well as special programs for the gifted, the slow learner, and the physically handicapped.

The Place of Industrial Arts in the School Program

Elementary Level, K-6

Industrial arts at this level enriches the general program of the classroom. It contributes to the personal development of the child and aids in acquainting him with his environment. Many of the experiences with tools and materials provide exciting worthwhile activities for typical elementary school projects and units. It has no standard content as such, but it helps the classroom teacher and the school to do better the things which they are already trying to do. The industrial arts teacher may serve as consultant to the elementary teachers in a community. As a distinct subject, however, industrial arts may begin in grade six.

Junior High School Level, Grades 7-9

Industrial arts at the junior high school level is an essential part of the basic education program for both boys and girls. The need of these youth to discover their interests, abilities, limitations and opportunities as producers and consumers of industrial products and services is fundamental to their development and growth. In this program, students have an opportunity to sample or try out various occupations in the manufacturing (wood, metals, plastics, graphic arts, etc.) electrical and power industries. The shop and the program should be well organized and offer as wide a variety of experiences as is feasible. Through such a program avocational and vocational interests and abilities should be revealed or will become more discernible as the youth develop.

Senior High School Level, Grades 9-12

Industrial arts at the senior high school level in Maine should be required for every boy during his freshman year unless he has taken such a course at the junior high school level. Any youth who wishes may elect industrial arts thereafter, but it is offered particularly for those who show special interests and abilities in industrial technical fields. In the early years of this program the pupils should receive experiences in the manufacturing, construction, power and transportation, electrical-electronics and service industries. In the final year of the program pupils will have the opportunity to specialize in one of these industries, providing them with opportunities for advancement toward a chosen goal and occupation.

It should be understood that the industrial arts program at this level should not attempt to provide any more than a sound basis for occupational choice with some competence and skill for initial employment or specialized training. Preparation for the skilled trades and technical employment can best be provided in vocational-technical programs equipped and designed to meet such needs.

Industrial Arts Shops

There are three distinct kinds of industrial arts shops in common use in Maine today. These are the comprehensive general shop, the general shop and the general unit shop. Each has its place in the framework of industrial arts education.

The Comprehensive General Shop

The comprehensive general shop contains equipment for instruction in four or more industries or sections of work in one room, usually under the direction of a single teacher. It is the basic type of industrial arts shop and is recommended for all small schools having only one shop. The four major industries or sections of work recommended for comprehensive general shops are: manufacturing (wood, metal, plastics, etc.), construction, electrical-electronics, power and transportation and service industries. Each of these industries or sections of work can be sub-divided into several different kinds of activities representative of several types of occupations found in the industry. For example, the construction industry or sections of work may include facilities for instruction in architectural drafting, carpentry and millwork, masonry, concrete work, plumbing and heating, plastering and painting. Similar sub-divisions may be found in the other three industries.

The General Shop

The general shop contains equipment for instruction in two or more industries or sections of work. General shops are usually found in a two or three-shop industrial arts department. In a department with two general shops each should contain equipment for instruction in two industries or sections of work. For example, in one shop manufacturing and construction industries would be studied, while in the other shop electrical-electronics and power and transportation industries would be taught.

When decisions are to be made regarding the distribution of industries

or sections of work among the general shops in a multishop department, due consideration should be given to the many factors involved. These include equipment needs, selection of suitable and compatible industries or sections of work, scheduling considerations and teacher abilities.

The General Unit Shop

The general unit shop contains equipment for instruction in several phases of one industry or section of work. Examples of this type of shop would be a general metal manufacturing and fabricating shop with work centers for foundry, machine shop, welding, forging and heat treating and sheet metal fabrication.

General unit shops are usually found in large senior high schools where the enrollment justifies four or more shops.

Occupational Course in Industrial Arts

Sequence:

An occupational course in industrial arts shall not be less than three years in length and shall have teachable content, including basic and related subjects, possessing continuity and providing pupils industrial experience of a progressive nature. Regardless of the grade in which he is enrolled, pupil placement in industrial arts classes shall be at that level which is commensurate with his previous experience. Once well placed, his interest in and ability to perform the work required in the course shall determine his advancement. Therefore, an approved occupational course must provide a sequence of at least three years in grade 9 through 12 unless combined with a full-time vocational trade course. Classes of one year or one semester may be offered for special groups.

Scope:

The program shall be comprehensive and shall include the four prescribed areas of major industrial activity which are: Wood and Metal Manufacturing and Fabrication, Construction, Electrical-Electronics and Power-Transportation.

In order to achieve progression of learning experiences and to encompass the subject matter which this curriculum implies, it is recommended that the program be extended over a six-year period as follows:

Grade 7	Manufacturing Industries
Grade 8	Manufacturing Industries
Grade 9	Manufacturing Industries

Grade 10	Manufacturing Industries Construction Industries
Grade 11	Power and Transportation Industries Electrical-Electronics Industries
Grade 12	Service Industries Area of Specialization (vocational orientation) or
Grade 12	Areas of Specialization (vocational orientation)

Time Requirements:

To fulfill the purposes of the program at each level, sufficient time should be allocated not only for the instructional activities but also for getting out materials, tools, and products at the beginning of the period, and for putting these away, washing up, and restoring the shop to order at the close of the period. Double periods, for this reason, are more ideally suited and should be provided whenever possible. Single periods, either separately or as part of a double period, may be devoted to research, planning, designing, reading, discussion, writing, reporting, or the like, which are a necessary part of the program.

The minimum weekly time allotments for each grade level, based on one semester of work for grades 7 and 8 and two semesters of work for grades 9 through 12 should be:

Grade 7	4 periods	18 weeks	160-220 minutes
	or		
	2 periods	36 weeks	80-110 minutes
Grade 8	4 periods	18 weeks	160-220 minutes
	or		
	2 periods	36 weeks	80-110 minutes
Grade 9	5 periods (2 double and 1 single)		200-275 minutes

Grade 10	5 periods	(2 double and 1 single)	200-275 minutes
Grade 11	7 periods	(2 double and three single) or (3 double and one single)	280-up
Grade 12	7 periods	(2 double and three single) or (3 double and one single)	280-up

In no case should the laboratory time be less than 200 minutes per week in grades 9 and 10, or less than 280 minutes in grades 11 and 12. If a full Carnegie unit of credit is to be allowed, the laboratory time should be supplemented by outside assignments to make up a total of 400 minutes per week.

Description of what is Included in the Industrial Arts Program

Industrial arts is organized on a basis as representative of modern industry as is possible within practical limits. In Maine, the program embraces the broad areas of wood and metal manufacturing and fabrication, construction, electrical-electronics, power-transportation and service. Graphic arts is also considered. Drawing, sketching and planning are basic to all. These areas are not regarded as subjects but as areas of experience and part of the total program.

To provide a true picture and sampling of industrial tools, materials, processes, products and occupations, each area should be presented on as broad a basis as is practical and feasible.

Wood Manufacturing and Fabrication Industries

Wood is one of the most common construction materials known to man. Its usefulness both as a raw material and a finished product constitutes a major factor of our culture. The occupations which can be represented in the industrial arts shop are: various line and staff positions of the industry, milling, production, cabinetmaking, patternmaking, carpentry and materials testing.

Metal Manufacturing and Fabrication Industries

Metal is another important material upon which our industrial and scientific technology depends. The sections of metal manufacturing and fabrication which can be taught are: various line and staff positions of the industry, machine work, production, foundry work, welding, forging and heat treating, sheet metal work, bench work and materials testing.

Residential Construction Industries

The residential construction industry occupies a major part of the construction industries in America. This phase of the construction industry utilizes a wide variety of materials and requires workers with a knowledge of assembly and construction operations, and varying levels of abilities and skills. The occupations which can be experienced in the industrial arts shop are: architectural drafting, carpentry and millwork, masonry, concrete work, plumbing, heating, plastering and painting.

Electrical-Electronics Industries

Electricity and its more highly technical counterpart, electronics, have been the prime movers in the development and growth of our present industrial, social and democratic culture. The industrial arts shop provides not only theoretical but also practical applications which are essential for their understanding. Low voltage wiring and circuitry, house wiring, power generation and distribution, motors, appliance repairs, radio transmission and reception are taught.

Power-Transportation Industries

The development of the combustion engine and similar sources of power for land, sea and air vehicles has been a major force in shrinking our world. Likewise, our increasing reliance upon power generated by gasoline and oil in our daily living makes it almost imperative that we understand not only the principles upon which such power is developed and used, but also how to maintain those vehicles and devices which utilize such power. The industrial arts shop can include in this area small gasoline engines (land and water), automotives,

rocket power and diesel engines.

Services Industries

The services industries have been established in response to the need for skilled technical servicing to keep the many and diverse products of industry in operation, and in service to the consumer whether this be the individual, business or industry itself. The industrial arts shop can include in this area, an understanding of small service business management, appliance servicing, automotive servicing and repair and refinishing industries.

Technical Drawing and Planning

This area provides the foundation for all industrial activities and in the same manner, for all industrial arts areas. Students should learn to read plans, sketch, create simple designs, draw working plans and become familiar with the basic tools and materials of instrumental and general drawing. They should also learn to develop consumer skills and knowledges in the selection of projects, materials, tools and products of industry. They should learn to plan operation procedures, use reference materials, estimate costs of production and prepare stock orders and bills of materials.

Graphic Arts

The printed word is the basis of our moral, spiritual, cultural, political and technical growth. The fields of printing and publishing contain many experiences which can be included in the industrial arts shop. Among these are: letter press and offset printing, stencil printing, binding, rubber stamp making and photography.

Functional Considerations in Planning Any Shop

I. NUMBER OF INDUSTRIAL ARTS SHOPS

In determining the number of shops for a new or existing building, consideration should be given the number of pupils who will be accommodated in shop classes. Sufficient space should be allotted to provide for estimated future enrollments and provision should be made for flexibility. Recommended departmental organization may be found under facilities.

II. PRINCIPLES RELATING TO SIZE OF ANY SHOP

The size of any shop will be determined in terms of the needs of the proposed program.

A. Following factors need to be carefully considered

1. the amount of equipment required
2. the amount and types of work stations
3. the nature and depth of the learning activities involved
4. the maximum number of students to be accommodated
5. the grade levels to be served

B. A logical method to determine space requirements

1. select the needed equipment in terms of the maximum number of students to be accommodated at one time.
2. make cardboard cutouts to scale of each piece of equipment, including needed working areas and allowing proper aisle space.
3. determine space required for office, instructional (classroom) and planning purposes.
4. determine space required for storage of materials, supplies, projects, finishing, etc.
5. then place the cutouts on a scaled layout to determine overall space needed.

III. PRINCIPLES RELATING TO THE SHAPE OF ANY SHOP

To promote efficiency, the aim should be to utilize a shape which would give the largest amount of area in the most compact shape. However, when this is done, such as in a square shop, valuable wall space is lost. As a compromise, therefore, the rectangular shape is recommended.

A. a ratio of width to length of 1 to 1½ as a minimum (most desirable) and 1 to 2 as a maximum is recommended. This pertains to the work area and does not include auxiliary rooms.

B. It is recommended that the width of a shop should never be less than 30 feet.

C. All irregular shapes of shops should be avoided.

IV. LOCATION OF SHOPS

It is recommended that the shops should be located in a special wing in a new building and an attached wing in an existing building.

V. ARCHITECTURAL DETAILS

A. Floors

Hardwood flooring, treated with a nonslip finish, is suggested for wood areas. In the areas of metals and transportation where the floors are subjected to considerable oil, grease, dirt and water, concrete floors are recommended. All other areas of work, wood or tile may be used.

B. Ceiling

The materials used for the ceiling should be of the accoustical type and light in color. The ceiling height of shops should not be less than ten feet. Twelve-foot ceilings should be provided whenever possible, especially where long materials will be handled. If an automobile lift is to be installed, ceiling clearance should be checked with the manufacturer.

C. Partitions

Partitions between shops should be soundproof and non-bearing so they may be easily moved to provide for expansion or changing conditions.

Partitions that form auxiliary rooms in which pupils will be working should have glass areas large enough to permit the instructor to supervise all activities. The entire shop area should be visible from any point.

D. Walls

The lower part of shop walls, up to a height of five or six feet, should be made of impervious materials which can be easily cleaned.

The lower portion of walls should be free from projecting beams or ducts to allow efficient placement of tool panels, cabinets, machines, chalkboards, bulletin boards and display shelves.

The window area in the shop should equal 15% of the floor area.

E. Windows

Full advantage should be taken of all possibilities for natural lighting. North light should be provided whenever possible.

F. Lighting

The shop must be well lighted. The light should be well diffused, eliminate glare at the line of vision and cast no shadows around the work. Sufficient artificial illumination is necessary so at least 50 foot candles of light is available for general room lighting and up to 100 foot candles for auxiliary lighting in special areas or for fine work.

G. Heat

A heating system, thermostatically controlled, sufficient to maintain a temperature of 68 degrees should be provided.

H. Ventilation

The ventilation system should provide a constant gentle flow of clean air at all times while the shop is in use.

I. Exhaust system

Special facilities should be provided to remove fumes, odors, vapors and dust in areas of the shop where they are likely to be present.

J. Power

Power controls should be centralized on a master control panel that can be locked. This panel should have a pilot light and

should be located near the instructor's desk or office. Provision should be made for one double electric outlet (110 volts) for every eight feet of wall length, with provision for ground cord. These outlets should be located approximately 42 inches above the floor.

Most shops can operate on 119-220 volts three phase electrical circuits. A bus system can be installed to take care of all machines not located near a wall.

Control buttons should be located at strategic parts of the shop so that the master control panel may be shut off immediately if the instructor sees a student in a hazardous position while working at a machine.

K. Color Scheme

A well-decorated shop promotes safety, improves students interest in classwork, encourages pride in the shop, aids in cleanup and makes the shop a more attractive place in which to work.

L. Auxiliary areas or rooms

The following auxiliary areas should be considered when planning a shop: drawing and planning area, finishing area, storage area, instructor's office and toilet facilities.

M. Entrances and exits

It is highly desirable to have at least two entrance-exits in every school shop. The doors should swing outward. An overhead door is needed for power mechanics or similar activities that are taught in the shop program.

N. Plumbing

A toilet facility should be located in the shop or in close proximity and should include one urinal, one flush and one electric hand dryer.

There should be a wash-up facility located near an entrance-exit. A Bradley semi-circular type washing sink is very satisfactory. A paper towel dispenser should be located nearby the wash-up facility.

A sink with an acid resistant trap should be installed in the metals area. A drinking fountain should be installed as a separate installation and properly located in the shop. A floor drain and an auxiliary water outlet should be located in the power mechanics area. An ample supply of hot and cold water should be supplied where needed in any facility.

Artificial gas should be available in the soldering, forging, heat treating and art metals areas of the shop.

An air compressor should be installed in all shops with outlets at needed points for spraying, etc. The compressor unit can be placed in an auxiliary room or outside the shop proper to eliminate the undesirable noise.

Facilities

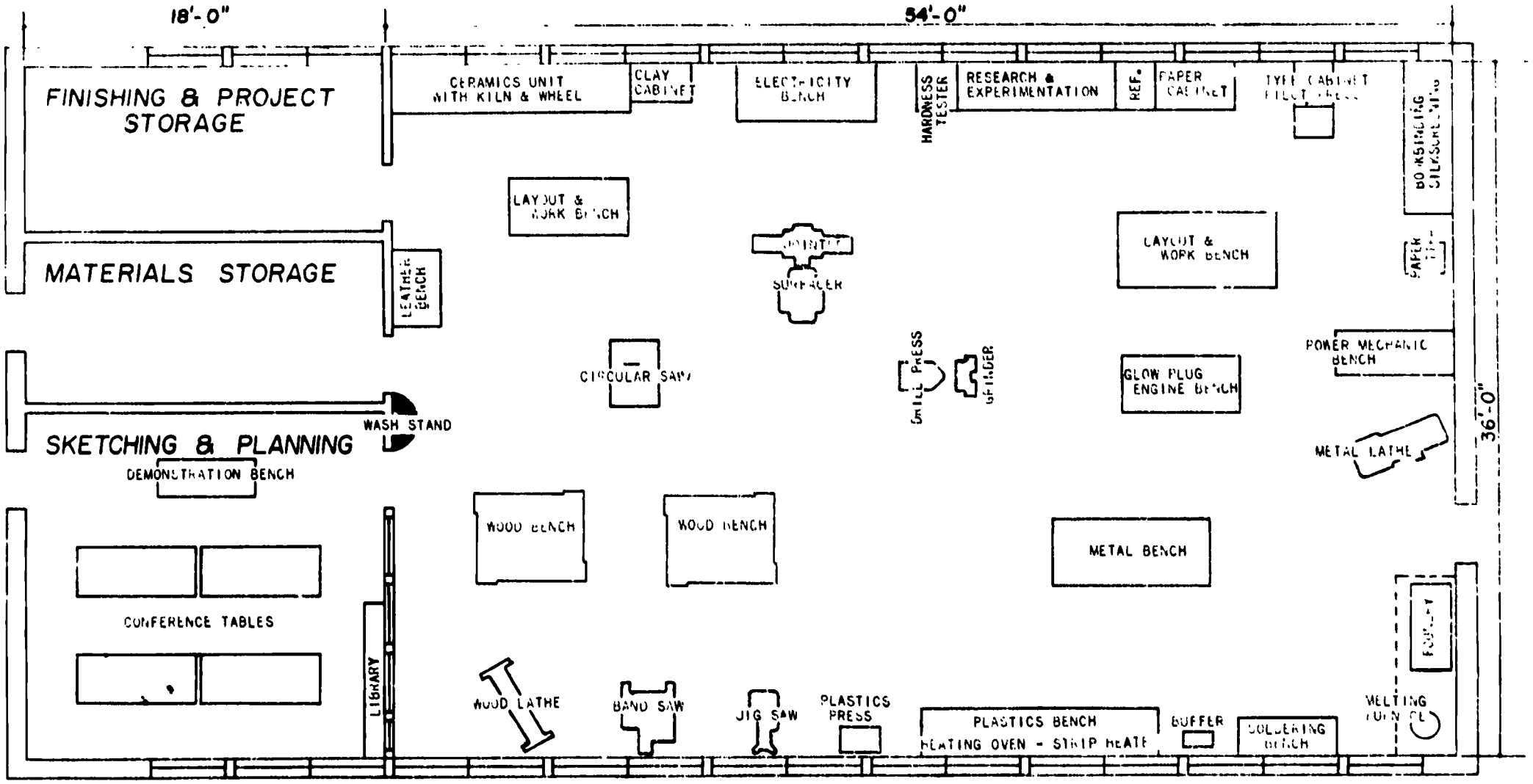
1. Space

In order that there is sufficient space in which to organize an approved industrial arts program, the following table may be used as a guide in planning industrial arts laboratories.

a. Recommended Number and Types of Industrial Arts Laboratories and Instruction That May be Provided for Junior High Schools and Grades Seven and Eight of the Elementary School According to School Enrollment.

Total School Enrollment	Number & Types of Laboratories	Space Requirement	Instructional Unit
To 250	One Unit		
	1. General Shop	Lab. area 2000 sq. ft. Aux. space 650 sq. ft. Total size 2650 sq. ft.	Manufacturing Industries (Woods, Metals, Plastics, Leather, Ceramics, Graphic Arts) Construction Industries Power & Transportation Ind. Electricity Research & Experimentation
250 to 500	Two Units		
	1. General Shop	Lab. area 2000 sq. ft. Aux. space 650 sq. ft. Total size 2650 sq. ft.	Manufacturing Industries (Woods, Metals, Plastics, Leather, Ceramics, Graphic Arts) Construction Industries Power & Transportation Ind. Electricity Research & Experimentation
	2. General Shop	Lab. area 2000 sq. ft. Aux. space 650 sq. ft. Total size 2650 sq. ft.	Manufacturing Industries (Woods, Metals, Plastics, Leather, Ceramics, Graphic Arts) Construction Industries Power & Transportation Ind. Electricity Research & Experimentation

Total School Enrollment	Number & Types of Laboratories	Space Requirement	Instruction Unit
500 to 750	**Three Units**		
	1. General Shop	Lab. area 2000 sq. ft. Aux. space 650 sq. ft. Total size 2650 sq. ft.	Manufacturing Industries (Woods, Metals, Plastics, Leather, Ceramics, Graphic Arts) Construction Industries Power & Transportation Ind. Electricity Research & Experimentation
	2. General Shop	Lab. area 2000 sq. ft. Aux. space 650 sq. ft. Total size 2650 sq. ft.	Manufacturing Industries (Woods, Metals, Plastics, Leather, Ceramics, Graphic Arts) Construction Industries Power & Transportation Ind. Electricity Research & Experimentation
	3. General Shop	Lab. area 2000 sq. ft. Aux. space 650 sq. ft. Total size 2650 sq. ft.	Manufacturing Industries (Woods, Metals, Plastics, Leather, Ceramics, Graphic Arts) Construction Industries Power & Transportation Ind. Electricity Research & Experimentation



INSTRUCTIONAL UNITS:

- SKETCHING & PLANNING
- WOODS
- METALS
- PLASTICS
- CERAMICS
- GRAPHIC ARTS
- ELECTRICITY
- POWER & TRANSPORTATION
- RESEARCH & EXPERIMENTATION

SPACE REQUIREMENTS:

LABORATORY AREA	1944 SQ. FT.
AUXILIARY SPACE	648 SQ. FT
TOTAL AREA	2592 SQ. FT.

STATE OF MAINE
DEPARTMENT OF EDUCATION
BUREAU OF VOCATIONAL EDUC

TYPICAL JUNIOR HIGH SCHOOL
INDUSTRIAL ARTS LAYOUT-ONE TEACHER

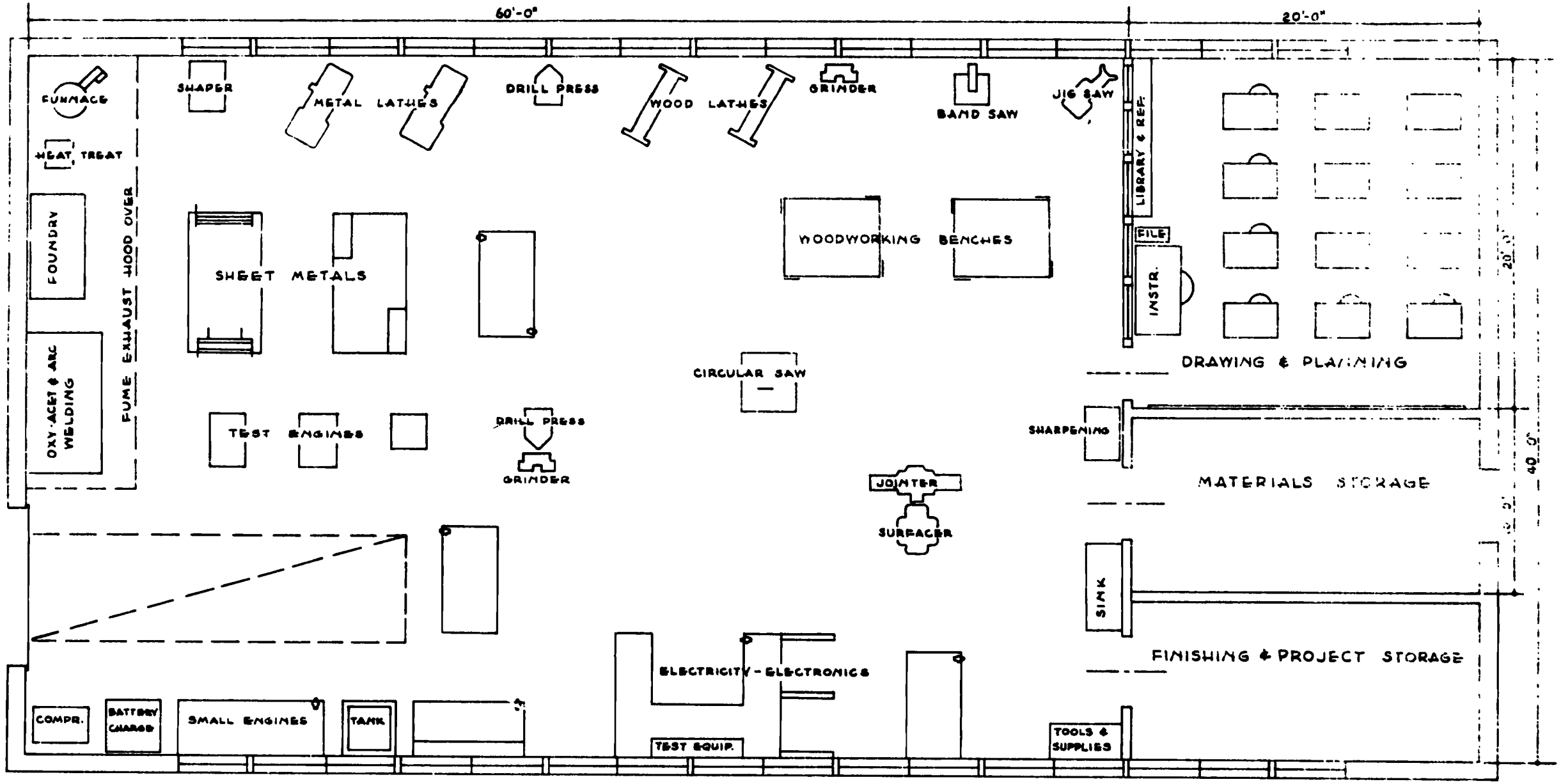
SCALE 0 FT 8 | JULY 1963 DR BY EAP

b. Recommended Number and Types of Industrial Arts Laboratories and Instruction That May be Provided for Four-Year and Senior High Schools According to School Enrollment

Total School Enrollment	Number & Types of Laboratories	Space Requirements	Instructional Units
To 250	ONE UNIT 1. Comprehensive General Shop	Lab. area 2400 sq. ft. Aux. area 800 sq. ft. Total size 3200 sq. ft.	Drawing & Planning Electricity-Electronics Metals Industries Power & Transportation Wood & Construction
250 to 500	TWO UNITS 1. General Shop	Lab. area 1800 sq. ft. Aux. area 600 sq. ft. Total size 2400 sq. ft. (Planning room would be common to both labs using Aux. space from each laboratory)	Drawing & Planning Metals Industries Wood & Construction
	2. General Shop	Lab. area 1800 sq. ft. Aux. area 600 sq. ft. Total size 2400 sq. ft.	Drawing & Planning Electricity-Electronics Power & Transportation
500 to 750	THREE UNITS 1. General Shop	Lab. area and aux. area 2800 sq. ft.	Drawing - Graphic Arts Communications Photography
	2. General Shop	Lab. area 1800 sq. ft. Aux. area 600 sq. ft. Total size 2400 sq. ft. (Planning room would be common to both labs using Aux. space from each laboratory)	Drawing & Planning Metal Industries Wood & Construction
	3. General Shop	Lab. area 1800 sq. ft. Aux. area 600 sq. ft. Total size 2400 sq. ft.	Drawing & Planning Electricity-Electronics Power & Transportation

Total School Enrollment	Number & Types of Laboratories	Space Requirements	Instructional Units
750 to 1000	FOUR UNITS plus Drafting Room	30 X 50 1500 sq. ft.	
	1. Wood Industries	40 x 60 2400 & Aux. room	Cabinet Making Construction (house) Boat Building Laminating Fiberglass Wood Turning
	2. Metal Industries	40 x 60 2400 & Aux. room	Plumbing Sheet Metal Bench Metal Welding Foundry Machining Forging Art Metal
	3. Electricity-Electronics industries	35 x 50 1600 & Aux. room	Fundamentals of electricity Radio Television Electric Motors
	4. Power & Transportation Industries	40 x 75 3000 & Aux. room	Small engines Outboards Auto mechanics Hydraulics Aircraft Diesel Jets
1000 to 1250	FIVE UNITS plus Drafting Room	30 x 50 1500 sq. ft.	
	1. Wood Industries	40 x 60 2400 & Aux. room	Cabinet Making House Construction Laminating Boat building Fiberglass

Total School Enrollment	Number & Types of Laboratories	Space Requirements	Instructional Units
	2. Metal Industries	40 x 60 2400 & Aux. room	Sheet Metal Bench Metal Art Metal Forging Foundry Welding Machining Plumbing
	3. Electricity-Electronics	35 x 50 1600 & Aux. room	Fundamentals of Elec. Radio Television Electric motors
	4. Power & Transportation	40 x 75 3000 & Aux. room	Small engines Outboards Auto mechanics Hydraulics Aircraft Diesel - jets
	5. Graphic Arts	36 x 50 1800 & Aux. room	Printing Block printing Offset Silkscreening Rubber stamp Book binding Laminating (plastics)



INSTRUCTIONAL UNITS:

- DRAWING & PLANNING
- ELECTRICITY - ELECTRONICS
- METALS INDUSTRIES
- POWER & TRANSPORTATION
- WOOD & CONSTRUCTION

SPACE REQUIREMENTS

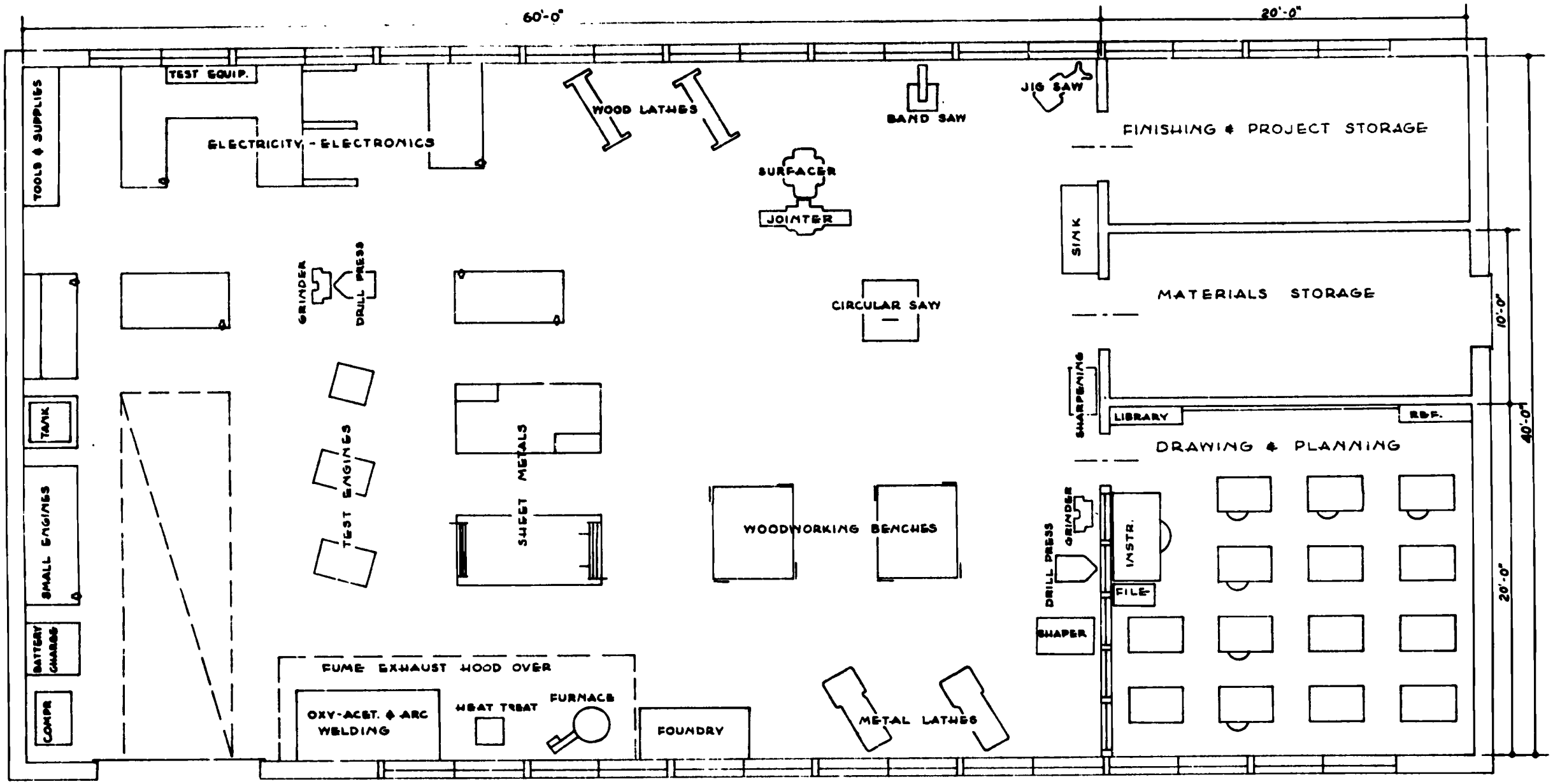
SHOP AREA —	2400 SQ.FT.
AUXILIARY SPACE —	800 SQ.FT.
TOTAL AREA —	3200 SQ FT

STATE OF MAINE
DEPARTMENT OF EDUCATION
BUREAU OF VOCATIONAL EDUC

TYPICAL INDUSTRIAL ARTS LAYOUT
FOR SINGLE TEACHER

SCALE 0 FT 5
PLAN 'A'

JULY 1962
DR BY JSG



INSTRUCTIONAL UNITS

- DRAWING & PLANNING
- ELECTRICITY – ELECTRONICS
- METALS INDUSTRIES
- POWER & TRANSPORTATION
- WOOD & CONSTRUCTION

SPACE REQUIREMENTS:

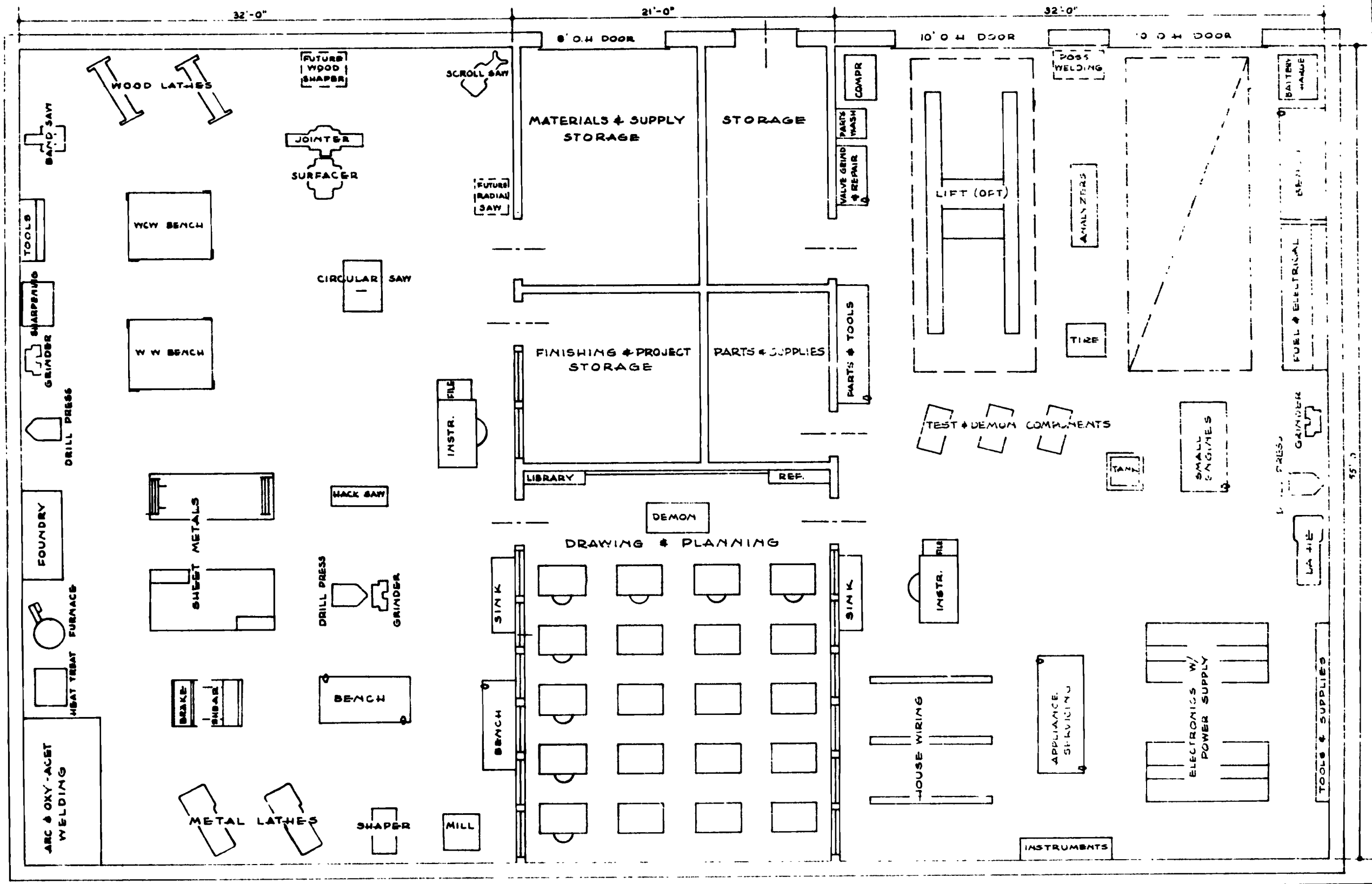
- SHOP AREA —— 2400 SQ. FT.
- AUXILIARY SPACE – 800 SQ. FT.
- TOTAL AREA —— 3200 SQ FT

STATE OF MAINE
DEPARTMENT OF EDUCATION
BUREAU OF VOCATIONAL EDUCATION

TYPICAL INDUSTRIAL ARTS LAYOUT
FOR ONE TEACHER SHOP

SCALE 0 FEET 5
PLAN 'B'

JULY 1962
DR. BY JSG



INSTRUCTIONAL UNITS — TWO TEACHERS

- DRAWING & PLANNING
- ELECTRICITY - ELECTRONICS
- METALS INDUSTRIES
- POWER & TRANSPORTATION
- WOODS & CONSTRUCTION

SPACE REQUIREMENTS

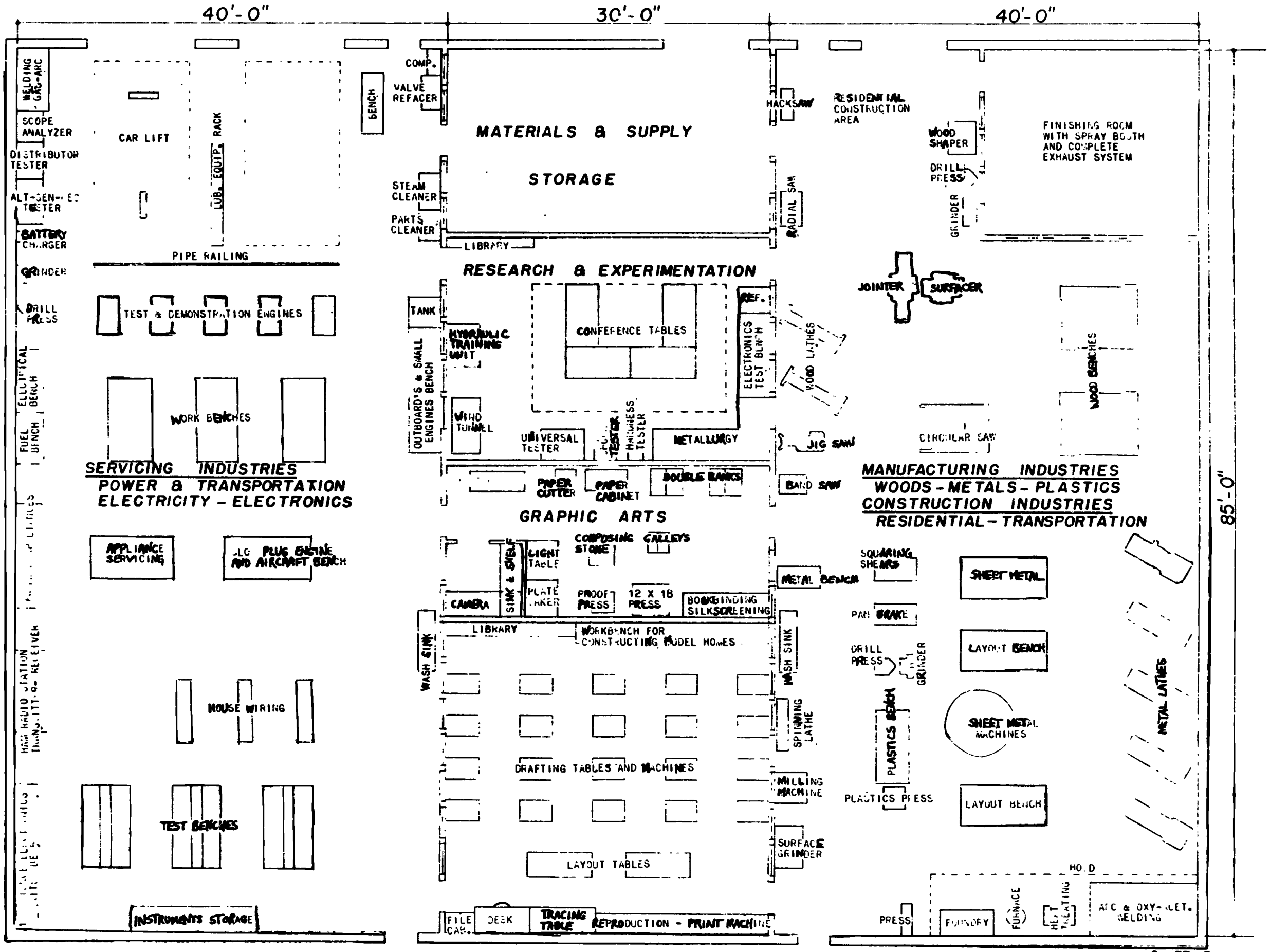
EACH SHOP AREA	1760 SQ FT
AUXILIARY SPACE	1135 SQ FT
TOTAL AREA	4675 SQ FT

STATE OF MAINE
DEPARTMENT OF EDUCATION
BUREAU OF VOCATIONAL EDUCATION

TYPICAL INDUSTRIAL ARTS LAYOUT

SCALE 0 FEET 8
PLAN 'C'

JULY 1962
DR BY JSG

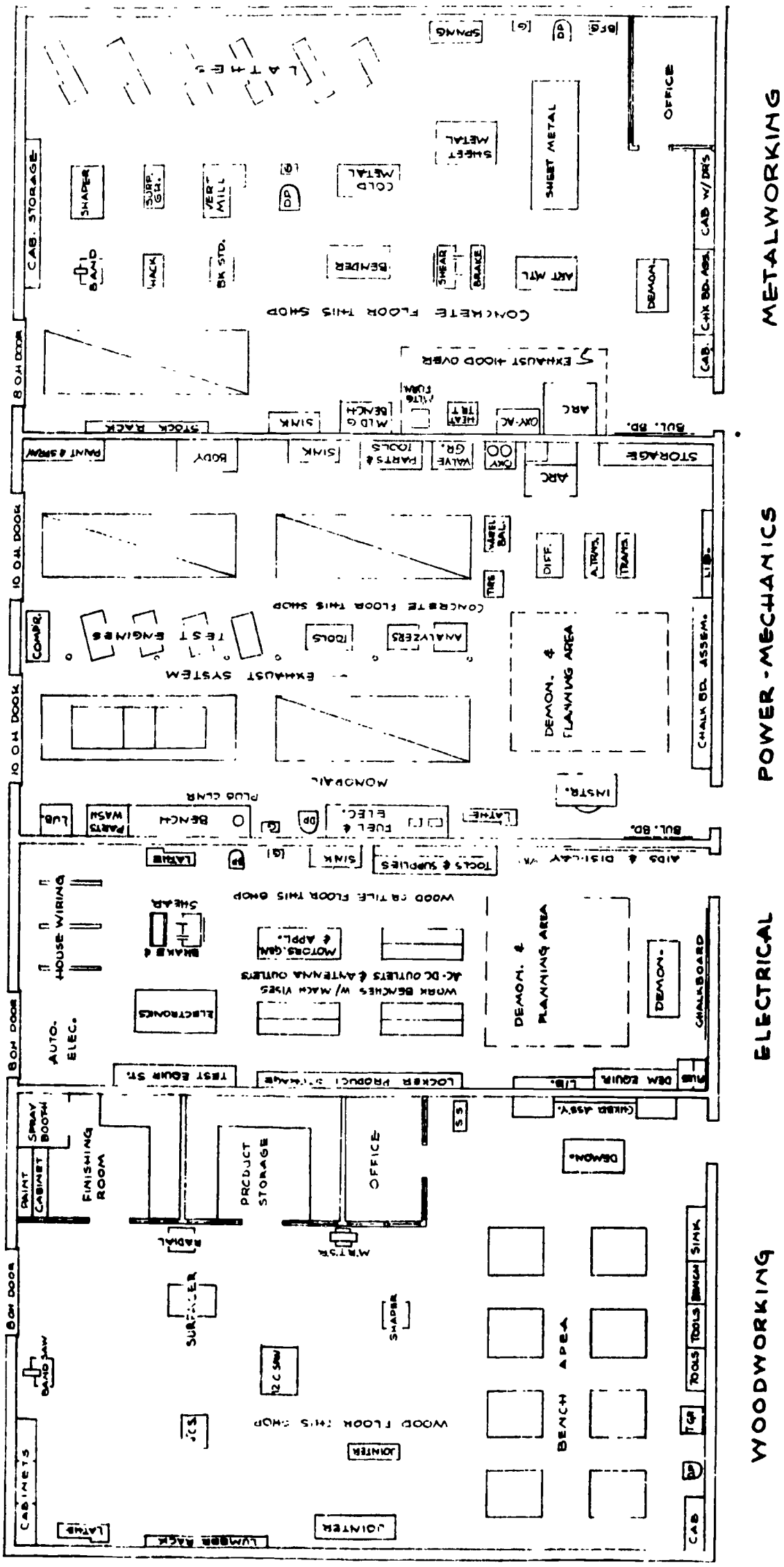

40'-0"
30'-0"
40'-0"
85'-0"
WELDING GAS-ARC
SCOPE ANALYZER
DISTRIBUTOR TESTER
ALT-GEN-REG TESTER
BATTERY CHARGER
GRINDER
DRILL PRESS
ELLIPTICAL
FUEL PUMP BENCH
CAR LIFT
LUB. EQUIP. RACK
PIPE RAILING
TEST & DEMONSTRATION ENGINES
WORK BENCHES
SERVICING INDUSTRIES
POWER & TRANSPORTATION
ELECTRICITY - ELECTRONICS
APPLIANCE SERVICING
PLUG ENGINE AND AIRCRAFT BENCH
HAM RADIO STATION TRANSMITTER & RECEIVER
HOUSE WIRING
TEST BENCHES
INSTRUMENTS STORAGE
BENCH
COMP.
VALVE REFACER
MATERIALS & SUPPLY
STORAGE
STEAM CLEANER
PARTS CLEANER
LIBRARY
HACKSAW
RADIAL SAW
RESIDENTIAL CONSTRUCTION AREA
WOOD SHAPER
DRILL PRESS
GRINDER
FINISHING ROOM WITH SPRAY BOOTH AND COMPLETE EXHAUST SYSTEM
RESEARCH & EXPERIMENTATION
TANK
HYDRAULIC TRAINING UNIT
OUTBOARD'S & SMALL ENGINES BENCH
WIND TUNNEL
CONFERENCE TABLES
REF.
ELECTRONICS TEST BENCH
WOOD LATHES
UNIVERSAL TESTER
HARDNESS TESTER
METALLURGY
JIG SAW
JOINTER
SURFACER
WOOD BENCHES
CIRCULAR SAW
PAPER CUTTER
PAPER CABINET
DOUBLE BANKS
BAND SAW
GRAPHIC ARTS
COMPOSING GALLEYS
STONE
LIGHT TABLE
SINK & SHELF
CAMERA
PLATE MAKER
PROOF PRESS
12 X 18 PRESS
BOOKBINDING SILKSCREENING
METAL BENCH
LIBRARY
WORKBENCH FOR CONSTRUCTING MODEL HOMES
WASH SINK
WASH SINK
SPINNING LATHE
DRAFTING TABLES AND MACHINES
MILLING MACHINE
SURFACE GRINDER
LAYOUT TABLES
FILE CAB.
DESK
TRACING TABLE
REPRODUCTION - PRINT MACHINE
MANUFACTURING INDUSTRIES
WOODS - METALS - PLASTICS
CONSTRUCTION INDUSTRIES
RESIDENTIAL - TRANSPORTATION
SQUARING SHEARS
SHEET METAL
PAN BRAKE
DRILL PRESS
GRINDER
LAYOUT BENCH
PLASTICS BENCH
SHEET METAL MACHINES
METAL LATHES
PLASTICS PRESS
LAYOUT BENCH
H.D.
PRESS
FOUNDRY
FURNACE
HEAT TREATING
ARC & OXY-ACET. WELDING
SCALE 0 FT. 5

Best available copy

STATE OF MAINE
DEPARTMENT OF EDUCATION
BUREAU OF VOCATIONAL EDUCATION

TYPICAL INDUSTRIAL ARTS LAYOUT
FOUR TEACHER

SCALE 0 5 10 | MAY 1965
PLAN "E" | DR. BY J.S.G.



Industrial Arts Equipment Inventory

The following list of tools, equipment and furniture are considered essential for successfully teaching industrial arts in the comprehensive general shop at the secondary level. This list is a revised copy of the 1956 booklet distributed by the state department of education. All items have been classified in terms of their function and were selected on the basis of their quality and ability to perform these functions well. Acceptable brand names and catalog numbers have been carefully indicated. Substitutions of equal or better quality and description may be made at the descretion of the instructor. Prices almost certainly will vary if the items listed are put out for bid as the prices listed herein are catalog prices and can only serve as an indication of what the current prices of individual items are at this time.

The quantity of each item has been listed for the various areas, with the belief that a class of 16 pupils would be a fair average. The prices indicated are as listed in 1965 catalogs from the leading industrial arts supply companies.

The total cost of the equipment found in this edition represents an investment of 23,000.00, which is an approximate increase of 250% over the 1956 edition.

June, 1965

LAYOUT TOOLS AND EQUIPMENT

	SIZE/CAP.	BRAND & CAT. NO.	W	M	E	T	GA	COST EA.
Awl, Scratch		Stanley 7A	3	3	2			1.20
Bevel, Sliding T	8"	Stanley 1PTB	1	1				3.00
Calipers, Hermaphrodite	6"	Starrett		1				4.10
Inside	6"	Starrett		1				3.20
Micrometer	0-1"	Browne & Sharpe 5994		1				16.00
Micrometer	1-2"	Browne & Sharpe 82		1				17.25
Outside	4"	Starrett 79		2				3.00
Outside	6"	Starrett 79		1				3.20
Outside	8"	Starrett 79	2					3.35
Pule		Browne & Sharpe 388	1					10.70
Dividers, Spring, Solid nut	6"	Starrett 83		1				3.20
Wing	8"	Stanley 58	1	1				4.75
Gauge, American Standard Wire		Starrett 281		1				6.90
Bit		Stanley 47	1					1.45
Center		Starrett 391		3				2.45
Protractor and Depth	6"	Starrett 493		1				9.15
Drill Point		Starrett 22 C		1				6.65
Fillet and Radius		Starrett 272A		1				4.95
Automotive Wire Gap		Snap-on 309W				1		1.75
Marking		Stanley 65G	2					3.05
Mortising (Butt)		Stanley 95 G	1					4.95
Screw Pitch		Starrett 40		1				3.30
Surface		Starrett 57B		1				14.50
Tap & Drill		Starrett 185		1				6.95
Telescoping (Set)		Starrett 5229F		1				14.10
Thickness		Starrett 172A				2		3.80
United States Standard		Starrett 263		1				6.90
Indicator, Dial Test, Universal		Starrett 196A		1				25.25
Level, Aluminum	24"	Columbian 6524	1	1				4.98
Plumb Bob		Lufkin ZD 29	1					.55
Punch, Center	$\frac{1}{4}$"x 5"	Starrett2640		2	1	1		.85
Hollow Tinners	5/8"	Pexto		1				3.40
Hollow Tinners	3/4"	Pexto		1				4.00
Hollow Tinners	7/8"	Pexto		1				4.85
Hollow Tinners	1"	Pexto		1				5.50
Drive Pin (Set)		Starrett 565		1				4.55
Prick	3/8" x 5"	Stanley 796		2	1	1		.80
Solid	1/8"	Stanley 641		1				.54
Chassis (Set)	1/2, 3/4, 7/8, 1, 1 1/4	Greenlee #730		1				15.65
Revolving		Osborne 223M		1				2.15
Rule, Circumference	36"	Pexto 95		1				7.30
Push-Pull	8'	Stanley W8	2	1				1.30
Shrink-rule	3/16" Shrink	Lufkin [illegible]	1					2.50
Steel Bench	12"	Lufkin [illegible]		2	2			2.65
Steel, Flexible	6"	Starrett 31[illegible]		3				1.85
Wood, Bench	12"	Stanley 74,V	6					1.65
Wood, Bench	24"	Stanley 34V	2					1.[illegible]
Scriber		Starrett 67			1			[illegible]
Stamps, Steel (Figures Set)		Pexto 90	1					3.35
(Letters Set)		Pexto 240	1					11.50

LAYOUT TOOLS AND EQUIPMENT

	SIZE/CAP.	BRAND & CAT. NO.	W	M	E	T	GA	COST EA.
Square, Combination		Stanley 1200	2	2				2.35
Combination Set	18"	Lufkin 525		1				27.00
Solid	3"	Starrett 20		1				13.95
Steel	24"	Stanley 100	2	1				4.75
Steel	12"	Stanley 12S	1					2.45
Try	8"	Stanley 12TS	4					2.50
Tape, Steel	50'	Lufkin H433	1					6.70
Trammel Points		Stanley 4TP	1					2.90
V-Block and Clamp (Set)		Starrett 271C		1				9.80
			122.15	30.45	11.50		1	#249.40
PLANNING EQUIPMENT								
Board, Drawing	18' x 24"						6	3.00
Compasses	6½"	Vemco C110					6	4.45
Curve, Irregular		K & E #3					3	.80
Drawing Instruments (Set)		K & E A-170-V					2	18.75
Scale, Architect	12"	K & E #18					6	.60
Triangle, 30-60	10"	K & E 630P					6	1.60
, 45-45	6"	K & E 945P					6	.60
Square, T	24"	K & E 11-P					6	3.80
Dividers	5"	K & E #13					6	1.70
Protractor	6"	K & E #26					2	.60
Lettering Set		Wrico Zephyr					1	8.82
								#144.42
TESTING AND MEASURING EQUIPMENT								
Alignment Set, Magnetic		Bender 30 INS, 400				1		212.95
Analyzer, Portable Kit		Allstate 29A2126K				1		99.95
Charger, Batter,	[illegible]	Allstate Sur-charge				1		[illegible]
[illegible]meter		Allstate				1		2.39
[illegible] meter		Jeston 3[illegible]5			1			16.95

TESTING AND MEASURING EQUIPMENT

	SIZE/CAP.	BRAND & CAT. NO.	W	M	E	T	GA	COST EA.
Gauge, Air Hose, Heavy Duty	10-130 lbs.	Allstate				1		9.65
Tire Pressure	20- 12	Allstate				2		3.80
Hydrometer, Battery		Allstate				1		1.59
Meter, Ammeter, Multiscale, A.C.		Simpson 370			1			22.50
Panel, A.C.	0-30 Volts	Tripplet 221			1			10.35
Panel, A.C.	0-250 Volts	Triplett 221			1			10.35
Volt-Ohm Milliammeter		Simpson 260			1			34.50
Watt-Hour, Single Phase		Local power company			1			Free
Oscilloscope	5"	Eico 425			1			69.95
Tester, All purpose electrical		Amerline			1	1		1.29
Armature Growler		Allstate				1		26.95
Cell, Voltage		Allstate				1		4.17
Compression Kit								
Timing and Vacuum		Allstate				1		14.49
Regulator, Generator		Allstate				1		43.95
Spark plug and tester		Allstate				1		56.50
Starter, Battery load		Allstate				1		45.95
Vacuum Tube		Eico 625						
Voltmeter, Vacuum Tube, Basic		Eico DEGGV				1		50.20
Electrical System, Basic		Lab Volt SES501				1		195.00
Generator, Audio Sine Wave		Lab Volt DT55R				1		99.00
Tube Tester, Mutual Conductance		Dynamic				1		179.95

115.80 1093.00 1359.00

CUTTING TOOLS

Bit, Auger (Set)	4 to 16	Irwin D13	1					15.75
Electricians	3/8" to 24"	Irwin 114E			1			2.95
Expansive	7/8" to 3"	Irwin 2	1					3.30
Countersink		Stanley 137	2	2				.80
Cutter, Circle	1 3/4" to 8"	Stanley 55	1					5.65
Drill and Countersink, Combined, HS	4	Cleveland 998		2				1.40
Do	5	Cleveland 998		3				2.05
Drill, Twist, Carbon (64ths)	1/16" to $\frac{1}{2}$"	Cleveland 5	1	1				28.90
Twist, Carbon (Numbers)	1 to 60	Cleveland 8		1	1			21.40
Do ($\frac{1}{2}$" shank)	$\frac{1}{2}$" to 1" (32)	Cleveland 120R		1				62.00
Twist, Carbon (Letter)	A to Z	Cleveland 55		1				42.90
(Stands for above drills)		Cleveland		4				2.45

	SIZE/CAP.	BRAND & CAT. NO.	W	M	E	T	GA	COST EA.
Reamer, Adjustable, with pilot	5/32" to 1 1/16"	Bluepoint, Rm3				1		70.55
Burring	½" round shank	Cleveland 120 R		1				4.50
Ridge	2 9/16" to 6"	Snap-on WR25				1		25.50
Screw Plate, Machine Screw Set		Greenfield OK Jr. B7		1				25.30
Screw Plate		Greenfield Little Giant		1				143.00
SAWING								
Saw, Back	12" 14tpi	Disston 4	4					5.65
Compass	12"	Disston 4	1					2.40
Coping	16½"	Disston 10	6					.85
Hack, Adjustable Pistol Grip	12"	Millers Falls 1027		2	1	1		2.26
Hack, Close Quarter		Snap-on A51				1		1.85
Hand, Panel	24" 10 tpi	Disston D23	1					8.55
Hand, Rip	24" 5½ tpi	Disston D23	1					8.55
Jewelers	5"	Parker 43		2				2.00
Nest of		Disston #7		1				4.60
SHEARING								
Chisel, Cape	¼"	Stanley 760C		1		1		1.15
Cold	½"	Stanley 743C		1		1		.90
Cold	3/4"	Stanley 745		1		1		1.15
Diamond Point	¼"	Stanley 770		1				1.15
Pocket, (Set)	¼" to 1½" (8ths)	Stanley 46	1					23.10
Round Nose	¼"	Stanley 765		1				1.15
Socket (Set)	¼" to 1" (8ths)	Stanley 720						
Cutter, Bolt	5/16" cap.	Porter		1				12.35
Diagonal	6"	Utica 41		1	2	1		2.90
Wire Nippers	7"	Utica 269		1				3.35
Glass		Red Devil	6					.50
Pipe	1/8 to 1¼" Cap.	Ridgid 1A		1				13.45
Tubing	1/8 to 1"	Ridgid 1C				1		3.90
File, Auger Bit	7"	Nicholson #20	1		1			.65
Contact Point		Nicholson				12		.30
Curve tooth, Standard D-	8tpi	(½ round) Vixen (Flat)				1		3.25
						1		2.75
Extra slim taper	4"	Nicholson	4					.35
Extra slim taper	6"	Nicholson	4					.45
Extra slim taper	8"	Nicholson	4					.65
Flat, Second cut	8"	Nicholson		2				1.00
Flat, Smooth	10"	Nicholson		2				1.45
Half round, Smooth	10"	Nicholson		1				1.75
Half round, second cut	8"	Nicholson	2					1.35
Half round, Bastard	10"	Nicholson	1					1.50
Mill, Second cut	8"	Nicholson		4				.75
Mill, second cut	10"	Nicholson		1				1.05
Mill, Bastard	10"	Nicholson		1				.75
[illegible]	¼"	Nicholson 1a		1				1.45
[illegible], Second cut	[illegible]	Nicholson		1		1		.80
[illegible], Smooth	10"	Nicholson		1		1		1.15
[illegible], Bastard	12"	Nicholson	1					1.85
[illegible], Second cut	8"	Nicholson		1				1.05
Three-square, Smooth	8"	Nicholson		[illegible]		1		1.45
[illegible]		[illegible]	1					3.60

CUTTING TOOLS CONTINUED

	SIZE/CAP.	BRAND & CAT. NO.	W	M	E	T	GA	COST EA.
Gouge, Outside Ground (Set)	¼" tol (8ths)	Buck Brothers 8	1					21.00
Knife, Sloyd	2 5/8"	Hyde 83	2		3	1		1.50
Trimming		Stanley 99				1		1.35
X-Acto (double set)		X-Acto 62				1		2.75
Opener, Can, Wall type		Dazey		1				3.75
Plane, Block		Stanley 60½	3					5.85
Block		Stanley 101				2		.95
Jack		Stanley 5	4					8.33
Smooth		Stanley 3	4					7.47
Spokeshave		Stanley 51SS	2					1.80
Scraper, Cabinet		Stanley 80M	2					4.25
Carbon, Flexible		Snap-on CS-1				2		1.95
Hand	3" x 5"	Disston 20	2					.45
Plumber's		Pexto		1				1.39
Putty Knife, Flexible	1¼"	Hyde	1			1		.85
Wire Brush		Coburn				1		1.50
Wood		Millers Falls	1					1.25
Shears, Trimmer, Straight	8"	Wiss38		1	1			3.90
Snips, Aviation, right	10"	Wiss M-2		1				3.85
Aviation, left	10"	Wiss M-1		1				3.85
Combination	3" cut	Wiss 19		2	1			6.25
Hawks Bill	3" cut	Pexto 15		1				7.60
Tools, Carving (set)		Buck Brothers	1					11.35
			225.20	44.10	4.40	36.69	1	*903.88

FORMING, ASSEMBLING and HOLDING TOOLS

	SIZE/CAP.	BRAND & CAT. NO.	W	M	E	T	GA	COST EA.
Anvil	50 lb.	Valcan	1					48.00
Bar, Pry and Jimmy		Craftsman				1		1.05
Rolling Wedge		Craftsman				1		2.25
Spreader and Removing		Cornwell X51				1		4.65
Wrecking	24"	Craftsman 99A6 597C	1					1.66
Brace, Bit	8"	Stanley 923	2					12.65
Clamp, Bar	2'	Hargrave 840	4					5.85
Bar	3'	Hargrave 840	4					6.35
Bar	4'	Hargrave 840	4					6.95
Carriage	4"	Hargrave 540P		2				2.15
Carriage	6"	Hargrave 540P		2				3.00
Carriage	8"	Hargrave 540P		2				4.55
Carriage	10"	Hargrave 540P		2				6.30
Handy	1"	Hargrave 1		2				.35
Handy	2"	Hargrave 2		2				.55
Quick	12"	Hargrave 498	4					3.10
Saw, [illegible]		Disston 2	1					10.50
Valve and tube vulcanizing		Allstate				1		3.55
Brake (set)		Snap-on				1		5.45

	SIZE/CAP.	BRAND & CAT. NO.	W	M	E	T	GA	COST EA.
Compressor, Piston ring, ratchet	2 1/8-5"	Craftsman 9A4 716				1		1.97
Valve spring	10½"	Craftsman 9A4 695				1		5.86
Copper, Electric	3/8" tip	Stanley 3138			2			8.45
Soldering (pair)	2 lbs.	Pexto		1				2.75
Dolly, Anvil		Snap-on BF714				1		10.95
Toe		Snap-on BF710				1		9.85
Expander, Piston Ring		Craftsman 9A4 661				1		1.83
Extractor, Screw (set)		Ezy-out 192		1				3.10
Tap (set)		Walton 1		1				10.00
Grips, Vise	7"	Peterson 7R				1		2.15
Vise	10"	Peterson 10R				1		2.45
Groover, Hand	4	Pexto 4		1				3.30
Hand	2	Pexto 2		1				3.50
Gun, Soldering		Weller S500			1			12.95
Hammer, Ball pein	8 Oz.	Stanley 308B		1	1	1		2.55
Ball pein	16 Oz.	Stanley 310B		2	2	1		2.90
Ball pein	32 Oz.	Stanley 314B				1		3.50
Blacksmith's hand	40 Oz.	Stanley 402		1				5.10
Combination Tire	32 Oz.	Snap-on BH38A				1		1.55
Curved Claw Nail	13 Oz.	Stanley 102	2		1			3.30
Do	16 Oz.	Stanley 101½	2					3.30
Dinging	8 Oz.	Snap-on BF611				1		8.95
Lead		Shop made						Free
Planishing	12 Oz.	Dixon 26		1				4.55
Riveting, Tinner's	12 Oz.	Stanley 462		1				3.80
Setting, Tinner's	12 Oz.	Stanley 452		1				3.80
Handle, File	2	Shur-Grip	6	6				2.40 D
File	3	Shur-Grip	6	6				3.00 D
File	4	Shur-Grip	6	6				3.00 D
Soldering Copper	7	Parker-Kalon		6	6			1.60 D
Handscrews, Adjustable	5/0 4"	Jorgenson	2					3.20
Adjustable	3/0 6"	Jorgenson	2					3.70
Adjustable	0 8"	Jorgenson	6					4.35
Adjustable	1 10"	Jorgenson	6					5.05
Hoist, Chain, Differential	1 ton	Craftsman F9A 7875				1		39.72
Inserter, Magnetic Key		Craftsman				1		1.80
Iron, Tire, Straight		Craftsman				1		1.19
Tire, Curved		Craftsman				1		1.29
Jack, Hydraulic	2 ton	Allstate 28A11				1		134.95
Jig, Metal Bending		Form-bend		1				4.30
Ladle, Melting, Bottom Pour	5"	Rowell		1				5.25
Lifter, Valve, Overhead		Craftsman				1		1.97
Valve, Screw-type		Craftsman				1		2.63

	SIZE/CAP.	BRAND & CAT. NO.	W	M	E	T	GA	COST EA.
Mallet, Carpenter's	2½ x 3 x 5"	Stanley	2					2.00
Plastic, Soft face	8 oz.	Stanley 594		1	1	1		3.00
Raw-hide	2" dia. 10 oz.	Stanley		1		1		2.45
Nailset	1/32	Millers Falls 601	1					.35
Nailset	2/32	Millers Falls 601	1					.35
Nailset	3/32	Millers Falls 601	1					.35
Plate, Bench (stake holder) (If not furnished with bench)	8" x 30"	Pexto 982		1				22.00
Pliers, Brake spring		Craftsman				1		2.30
Lock ring		Craftsman				1		2.00
Long chain nose, side cut	6"	Crescent			1	1		3.50
Round nose	6"	Kraueter 1611			1			3.75
Short chain nose	5"	Crescent		1	1	1		2.24
Side cutting	8"	Utica 50		1	1	1		4.40
Side cutting	6"	Utica 50			1			3.75
Slip joint, heavy duty	8"	Utica 511		1				1.15
Slip joint, heavy duty	10"	Utica 511				1		1.60
Water pump	9½"	Channel Lock 420				1		3.25
Puller, Gear, auto grip,	spread 5½"	Craftsman 9A4690				1		3.85
Do	spread 8"	Craftsman 9A4690				1		7.97
Hub, Universal 3 arm		Craftsman 9A4 664				1		10.48
Rivet set		Pexto 7		1				1.60
Rivet set		Pexto 6		1				1.75
Rivet set		Pexto 3		1				2.20
Screwdriver	4"	Stanley 20	1	1	1	1		.63
Screwdriver	6"	Stanley 20	1	1	1	1		.93
Screwdriver	8"	Stanley 20	1	1		1		1.20
Screwdriver	10"	Stanley 20	1	1		1		1.33
, close quarter		Stanley 1013				1		.55
, Phillips 1		Stanley 2701				1		.60
, Phillips 2		Stanley 2702				1		.70
, Phillips 3		Stanley 2703				1		.85
, Square blade	8"	Stanley 1007				1		2.20
, Thin blade	6"	Stanley 1008			1			.60
, Thin blade	10"	Stanley 1008			1			.77
Screwdriver, Bit	3/8"	Stanley 26	1					.90
, Clutch head (set)	5/32, ¼, 5/16					1		5.12
, Offset		Stanley 670				1		.70
, Offset		Yankee 3400				1		1.10
, Pocket		Stanley 1010			1			.35
Tongs, Gad		Stanley 16		1				8.55
Tool, Flaring (set)		Craftsman				1		4.75
Valve fitting		Allstate				1		.39
Valve Lapping		Allstate 9A4704				1		2.73
Tweezers, Soldering		Spreadhead & Garrett			1			2.75
Vise, Drill press	Model [illegible] Pivot-Lock Safety Vise			1		1		10.75
Machinist	7"	Columbian 603½		3		2		41.16
Utility		Columbian D43½		2	2	2		9.66
Woodworker, Rapid action		Columbian 1RD						18.00

	SIZE/CAP.	BRAND & CAT. NO.	W	M	E	T	GA	COST EA.
Wrench, Adjustable, alloy	4"	Crescent				1		1.90
Adjustable, alloy	6"	Crescent				1		1.95
Adjustable, alloy	8"	Crescent	1	1	1	1		2.30
Adjustable, alloy	10"	Crescent		1		1		2.85
Allen, socket set		Holo-chrome 4990-3/8		1		1		1.25
Bicycle spoke		Craftsman				1		.60
Box-end (set of 6)		Craftsman				1		6.27
Combination (set of 6)		Craftsman				1		5.23
Drain plug		Craftsman				1		.55
Ignition, combination midget, 8 piece		Craftsman				1		3.92
Monkey	12"	Billings Coes 91				1		5.65
Nut driver (set)		Craftsman			1			5.93
Pipe	8"	Ridgid				1		2.65
Rim		Snap-on 402				1		6.95
Socket (set of 45)	½" drive	Craftsman				1		42.55
Socket (set of 45)	¼" drive	Craftsman				1		39.95
Tap, "T" handle		Greenfield 328		1				1.05
Tappet (set of 6)		Billings 47				1		11.50
Torque	0 to 150 ft. lbs.	Craftsman				1		11.18
Torque	0 to 150 in. lbs.	Craftsman				1		10.85
FORMING, ASSEMBLING AND HOLDING TOOLS								
Seamer, Hand		794 Pexto 1		1				5.50
Stake, Beakhorn		901 Pexto 1		1				65.00
, Blowhorn		925 Pexto 1		1				39.00
, Needlecase		957 Pexto 1		1				22.00
, Bevel-edge square		932 Pexto 1		1				22.00
MACHINES AND HEATING EQUIPMENT								
Brake, Box-pan		Di-Acro Model 24		1				297.00
Specifications:	24" width, 16 ga. Capacity mild steel							
	(Stand for Box-pan Brake)			1				65.00
Compressor, Air		DeVilbiss #UDJ5002				1		279.95
Specifications:	½ h.p. motor, single phase, 110 v., A.C. 1 cyl., 30 gallon tank							
Accessories:	Motor starter, single phase					1		6.95
	Airline hose, 25 ', w/ male connections at ends					1		6.25
Former, Slip-roll	30"	Pexto 381		1				145.00
Furnace, Bench combination, gas w/melting pot		Johnson 118		2				59.90
Furnace, Melting, w/blower, 3 crucibles		Speedi-melt 16-1		1				361.00
Accessories:	Shank, hand	Western Materials S-10		1				10.00
	Tongs, Plain crucible	Western Materials 10B		1				26.50
Grinder, Tool		Delta 23221	1	1				175.15
Specifications:	½ h.p. motor, 60cycle, single phase, A.C. 2-7" Aluminum oxide wheels, 1267 & 283-815 Waterpot, twin light safety shields, 4 lamp bulbs, wheel guards, tool rests and pedestal.							

	SIZE/CAP.	BRAND & CAT. NO.	W	M	E	T	GA	COST EA.
Grinder, Tool								
Accessories:	Medium knotted wire brush, 6", 5/8 bore	#1237		1				7.20
	Plane blade grinding attachment,	#1294	1					13.95
Jointer	6"	Delta #37-221	1					208.55
Specifications:	½ h.p. motor, 220/440 3 ph. A.C., 1725 rpm w/manual starter, motor pulley, V-pulley, 3 h.s. steel knives, 2-way tilting fence w/dual control, arbor pulley, front safety knife guard, cast iron stand.							
	(Motor for above- Delta 66-000		1					37.40
Lathe, Metalworking		South Bend CL-644Z		3				525.00
Specifications:	9" bench, 3' or 3½' bed, quick change, Horizontal drive, Countershaft w/power cross feed, ½ h.p. motor, 110/220 single phase A.C.							
Accessories:	Chuck, Independent, 6" w/wrench	CL4006NK		2				51.00
	Universal, 5" w/wrench	CL3005NK		2				82.00
	Jacobs w/arbor, ½" cap.	#2 Morse Ta.		2				13.70
	Dog (set of 6) 3/8" to 1½"	CE2105		1				10.00
	Knurling tool, revolving head	CE3615		2				20.75
	Motor control, Drum type	EH179		3				8.50
	Tool holder, Boring	CE423		1				12.71
	, Cut-off, Rt. Hand	CE736R		2				7.38
	, Left hand	CE847L		2				3.22
	, Right hand	CE847R		2				3.22
	, Straight	CE847S		2				3.22
	Bench, angle steel, 26 x 60 x 29 3/16	CE1780		2				46.50
Lathe, Woodworking		Delta 46-212	2					316.70
Specifications:	12", 37" between centers, 57" O.A., 4-speed bench, pulleys, ½h.p. motor, 115/230 single phase, A.C., switch rod							
Accessories:	Face plate, 6"	937	2					5.35
	Tools, Basic set of 8	130	2					23.45
Machine, Combination	sheet metal rotary	Pexto CO 547		1				134.00
Planer, Surface	12" x 5"	Powermatic 100	1					490.00
Specifications:	Safety type ball bearing cutterhead w/three knives, 2 groove cutter head pulley, belt guards, floor stand w/motor base, 2 h.p. motor, 3 phase w/manual switch							
Press, Drill	15"	Delta 15-208	1	1				163.35
Specifications:	Belt guard, pivoting motor mount plate, Built in depth gauge, depth stop, motor pulley, V-belt, ½" Jacobs chuch w/key							
Accessories:	½ h.p. motor, Delta, 115.230, 1725 rpm, 60 cycle, A.C., with starter	#62-000	1	1				41.65

	SIZE/CAP.	BRAND & CAT. NO.	W	M	E	T	GA	COST EA.
Press, Hand fed	10" x 15" Chase size	Chandler & Price Model 1					1	2268.00
Accessories:	10" x 15" Chase						2	16.95
	1 h.p. motor, 115/230, 1725 rpm, 60 cycle A.C.						1	41.65
Press, Proof	# 1534H	Challenge					1	287.00
Specifications:	w/stand, 10" x 12" ink plate and brayer							
Press, Offset	Model 241	Davidson Dual					1	2100.00
Specifications:	Floor space: 26" x 72" x 56" high, Weight w/feeder 726 lbs., Sheet size: Max. 10" x 14", Min. 3" x 5", Motor: ¼ h.p. re ulsion-induction, 1725 rpm Belt: molded rubber endlessV w/adj. pulley							
Press, Rubber stamp		Berkroy					1	199.50
Accessories:	# 1 supply kit for Berkroy						1	35.00
Router- Shaper		Stanley H264	1					55.95
Specifications:	7/8 h.p. motor, base, chuck, sub-base							
Accessories:	Bit, Beading	#85125	1					5.65
	Cove.	#85128	1					5.65
	Rounding over	#85120	1					4.15
	Straight	#85095	1					1.35
	Straight	#85098	1					1.85
	Veining	#85106	1					1.85
	Gauge, Straight and Circular	H280	1					3.40
	Tip, Templet	GA-H225	1					8.40
	Wheel, Grinding	MSH 195	1					1.55
	Wheel, Grinding	MSH 210	1					1.00
Saw, Circular	10"	Delta Unisaw 34451	1					542.50
Specifications:	Guard, Splitter, extension wings, micro-set rip fence, combination blade, miter gauge, front graduated guide bar, rear guide bar, motor pulley, set/3 matched V belts, 2 H.P. motor, 3 phase w/manual starter							
Accessories:	Dado head, 6" diameter, 5/8" hole, 1/16" to 13/16"-34-333		1					32.50
	Dado table insert	1452	1					5.50
Saw, Band, Wood cutting	14"	Delta 287	1					268.10
Specifications:	Wheel guards, arbor pulley, wood cutting blade, cast iron stand, belt guard, V belt and motor pulley, ½h.p. motor, 3 phase, 220/440, 60 cycle, A.C., 1725 r.p.m., Manual starter size 0, across the line type for motor:							
Saw, Miter box w/saw	28 x 4" saw	Stanley 2246	1					62.65
Saw, Power hack		Wells #300		1				263.00
Specifications:	Satnd model w/ ¼ h.p. motor (Split phase)							
Saw, Scroll	24"	Delta 40-405	1					173.75
Specifications:	Stand, 4-step cone pulley, 4-step motor pulley, V belt, belt and pulley guard, 1 saber and 3 scroll blades							
Accessories:	¼ h.p. motor, 115-230, 60 cycle A.C., with on-off switch (62-110 Delta, single phase)		1					42.75

		SIZE/CAP.	BRAND & CAT. NO.	W	M	E	T	GA	COST EA
Shaper, Metal		7"	South Bend CS100		1				632.00
	Specifications:	Vise, drive unit for motor, motor pulley, V-belt, guards, work light, built-in push button type across line manual starter, motor included							
	Accessories:	Tool holder	CS9630		1				10.35
		Machine stand	20" x 32" x 29 3/8" CE9141		1				27.50
Welder, Electric		A.C. 180 amps w/arc booster,	Lincwelder AC1805		1				120.00
	Accessories:	25' #4 electrode cable, 20' #4 ground cable, LPH-2 head shield, 10 LVH lense, non-spatter cover glass, INS electrode holder, GC-300 Ground clamp(Complete kit)			1				35.00
Welder, Oxy-acetylene			Broadhead-Garrett 3745		1				208.00
	Specifications:	Complete kit to include the following: Pipeliner torch set Econoflow oxygen regulator Econoflow acetylene regulator Hose, 25' 3/16" 2 in 1 Goggles, pair Lighter, friction Wrench							
Machine, Milling		# 21-100	Delta Vertical		1				960.00
	Specifications:	Working surface 6½ x 24", range 16" long Cross-feed travel 6 3/4", Vert. travel 10½", Spindle taper R8, Quill 3" diameter, Ht. 72", Width 37 3/4", depth 33 3/4", with cabinet base.							
	Accessories:	Motor, Delta 66-510 3 phase, 5/8" shaft, 1725 rpm, 208/220/440 volt, 60 cycle A.C.			1				40.00
		Magnetic Starter # 49-396			1				42.35
		Reversing Drum switch #49-392			1				17.90
		Belt Guard #21-813			1				5.50
		Machine Vise #21-811			1				63.50
		Collets (set of 6) #21-800			1				45.00
		End Mill holder #21-806			1				17.75
		Arbor for Drill chuck (#3 Jacobs chuck)			1				10.00
		Lamp Attachment			1				10.35
		Vertical Milling cutters (set 1/8" to 3/4")			1				40.00
		Woodruff Keyway cutters #404	1/8"		1				5.25
		# 605	3/16"		1				6.00
		#806	¼"		1				6.25
		#1208	3/8"		1				7.00
				2864.45	1433.57		293.15	415.05	1431.76

PORTABLE MACHINES

Drill, Electric, standard duty ¼"			Porter-Cable 575		1				55.00
Drill, Electric, standard duty 5/8"			Porter-Cable 580				1		135.00
Sander, belt, heavy duty		3" x 24"	Porter-Cable 503	1					185.50
Sander, finishing			Porter-Cable 106A	1					65.50

	SIZE/CAP.	BRAND & CAT. NO.	W	M	E	T	GA	COST EA.
Bellows, Molders	10"	Patterson Bros.		1				8.65
Bulb and sponge	4 oz.	Patterson Bros.		1				3.85
Flask, Wood	10" x 12"	Shop made		1				n.c.
Flask, Metal	10" x 12"	Ideal		1				45.00
Rammer, bench	3½" x 14"	Patterson Bros.		1				4.31
Riddle (Galvanized wire)	16"	Patterson Bros.		1				3.65
Slick and Oval	1"	Patterson Bros.		1				2.75
Trowel, Square	1¼" x 6"	Patterson Bros.		1				3.15
Tire bead Band		Allstate				1		1.85
Battery, Storage	6 volts, 3 cell, 130	amp hr. Allstate				1		17.00
Cables, Booster (set)	8'	Allstate				1		3.79
Creeper, Auto	16" x 36"	Craftsman				1		7.62
Electri-Kit		Crow Model 100G			1			209.90
Lamp, trouble, heavy cord w/lamp protector,		2 outlets			1	1		3.80
Torch, Master w/pencil burner and cylinder		Bernz-O-Matic TX-10		1				9.95
Tube, brake bleeder		Allstate				2		.21
Vacuum Frame, Plate maker	30" x 40"	Nu-Arc Model FT-18M					1	495.00
Cutter, Paper	30½" cutter	Challenge Model 305					1	1556.00
Sink, Darkroom Developing		Brown Model 1615 FG					1	550.00
Safelight and Viewer, Darkroom		NuArc Model 19E					1	103.00
Dispenser, Tape	Two roll core	Scotch C-22					1	6.50
Gun, Spray, Offset	(to fit Model 251 Davidson)	Dry-Easy Flo					1	69.85
Thermometer, Developing		Weksler #237Y					1	2.00
Knife, Stripping		X-Acto #1					2	.60
(Blades for above: Nos. 10 and 11)							3	.60
Funnel, Stainless Steel		Globe					1	7.45
Graduate, Stainless Steel	1 qt. Cap.	Globe					1	8.45
Test paper, Litho		Hydroin PH					1	6.00
Brushes, Artists Opaque		Red Head					6	.35
Trays, Photographic	11" x 14"	Cesco-lite					2	4.50
Triangles, Plastic	10"	Alteneder No. 2911					2	2.25

	SIZE/CAP.	BRAND & CAT. NO.	W	M	E	T	GA	COST EA.
Timer		Gralab Model 165					1	23.95
Tank, Storage and mixing	5 gal. cap.	Globe					1	14.50
Stick, Composing	8"	Rouse					2	10.70
Composing	12"	Rouse					1	12.80
Can, Benzine, Brass	1 qt. cap.						2	4.25
Reglets, Wood	6 and 12 point	Hamilton (25 strips)					2	.13
Gauge, Printers Line		Lufkin No. 527S					4	4.30
Rule, Newspaper	Agate and non-pariel	Lufkin No. 573					1	8.80
Pins, Gauge		Megill (Hand fed &					6	.65
		Auto feed)					6	.75
Knife, Ink	$3\frac{1}{2}$" x $1\frac{1}{2}$"	Lamson Square End					2	1.75
Cutter, Lead and Rule		Rouse No. 45					1	97.00
Mallet, Rubber	8 oz.						1	2.75
Mitering Machine, Hand	83 pica	Rouse					1	110.00
Machine, Numbering		Challenge					2	32.00
Press, Padding		ChapPadco #8303-13					1	15.75
Planer, Type (w/leather top)	6"						1	2.25
Quoins, Wickersham	5/8" wide	#1					6	12.50
Regular		Challenge #1 standard					6	3.50
Knife, Makeready, Overlay		Lamson					1	1.00
Key, Quoin, high speed	"T" head	Challenge					1	3.50
Quoin (for Wickersham)		"2"					1	2.80
Holder, Tympan paper	12 " or 20"	Rouse					1	33.00
Tweezers, Printers	(narrow point)	Globe model 430					1	1.00
Stitcher, Wire		Acme-Champion Model A					1	424.00
Leads and Slugs		ATF Duration * 1 pt.					1	5.50
		* 2 pt.					1	4.95
	(All leads and slugs	* 3 pt.					1	4.95
	available in strips	* 4 pt.					1	4.95
	24" long)	* 6 pt.					1	4.95
		*12 pt.					1	5.30
* denotes one package of each size								
Spaces and quads, Type foundry		ATF, #2102-6, 8, 10, 12, 14, 18, 24, 30 (Complete Assortment)					1	4.40

	SIZE/CAP.	BRAND & CAT. NO.	W	M	E	T	GA	COST EA.
Type, Foundry		American Type Founders						
(A carefully selected list of foundry type must be made by the instructor. Some of the more popular type faces are listed at the right. This list is by no means complete and is only to serve as a guide)		8 pt. Bank Gothic Light					1	9.05
		10 pt. Bank Gothic Light					1	10.45
		10 pt. Brush Medium					1	10.45
		12 pt. Brush Medium					1	11.25
		6 pt. Century Expanded					1	8.10
		8 pt. Century Expanded					1	9.05
		8 pt. Century Expanded (Italic)					1	9.05
		10 pt. Copperplate Gothic					1	10.45
		12 pt. Copperplate Gothic					1	11.25
		12 pt. Liberty 511					1	11.25
		14 pt. Liberty 511					1	13.60
		18 pt. Liberty 511					1	14.65
		12 pt. Royal Script 304					1	11.25
		18 pt. Royal Script 304					1	14.65
		14 pt. Stymie Bold 511					1	13.60
		18 pt. Stymie Bold 511					1	14.65
Thin Spaces, Brass & Copper		No. 20A Assortment Copper thin spaces					1	5.50
		No. 20B Assortment Brass thin spaces					1	5.50
Transportation								
Strap-Battery Carrier		Allstate				1		.30
			2	1	1	1	1	4194.75
MAINTENANCE TOOLS AND EQUIPMENT								
Brush, Glue	1"	Broadhead & Garrett 612	2					.70
Burnisher		Stanley 185	1					1.80
Card, File and Brush		Nicholson	1	2				1.80
Do, Common		Nicholson	2	2	1	1		1.05
Duster, Counter		Broadhead & Garrett 2292	4	4	2	2		18.85 d
Dustpan			1	1	1	1		2.00
Dresser, Wheel		Huntington No. 0	1	1				1.45
Funnel	8"	Allstate				1		.98
Gun, Grease		Broadhead & Garrett 1169				1		4.50
Grease, hand	23 oz.	Allstate				1		2.55
Suction, Oil	20 oz.	Allstate				1		2.75
Hone, Burnishing	2 11/16" to 4 1/8"	Craftsman				1		9.75
Measure, Quart		Allstate				1		1.65

	SIZE/CAP.	BRAND & CAT. NO.	W	M	E	T	GA	COST EA.
Oiler, Bench, steel	½ pint	149C Eagle		3		2	1	.65
Bench, steel	1/3 pint	139C Eagle	1	1	1	1	2	.50
Hydraulic pump	1 pint	Broadhead & Garrett				1		2.10
Spring, Automobile	1/3 pint	Broadhead & Garrett	1			1		1.80
Oilstone, India-Washita, Combination		Arkansas No. 186	1					2.40
Slip, India		Arkansas No. 44	1					1.10
Slip, India pocket		Norton 1B 134		2				1.50
Slip, Carving tool set, India		Norton FS-76	1					3.50
Opener, can and oil spout		Allstate				1		1.49
Set, Saw		Disston 34	1					7.35
Sweep, floor, all black horsehair	16"	Broadhead & Garrett	2	1	1	1	1	6.40

1 @ 15.40
2 @ 9.10
1 @ 1.25
1 @ 2.35
1 @ 5.05
= 34402

SAFETY AND FIRST AID EQUIPMENT

Apron, Chrome leather	24" x 36"			1				9.10
Curtain	to required specifications			1				4.00
Extinguisher, Fire CO_2	5 lb.		1	1	1	1	1	28.80
Fan, Exhaust 1680 Cu. ft/min.	16" blade	Diehl 16FPD16		1				95.00
First Aid Kit, General		Johnson & Johnson	1			1		15.00
Gloves, Rubber		Resisto		1		1		5.00
Welder's Chrome leather Gauntlet				2				5.50
Goggles, Safety		Monogoggle 91A	2	2	2	2	2	2.85
Hose, Flexible Exhaust, metal	3" x 10'	Allstate				1		5.95
Oily Waste Can	Automatic 10 gallon	Justrite 9-3	1			1	1	12.95
Puller, Fuse		Ideal			1			1.15
Shield, Face		Protector V1-44		3				5.95
Stand, Jack, Pair	3 ton	Allstate				1		15.10

FURNITURE

	SIZE/CAP.	BRAND & CAT. NO.	W	M	E	T	GA	COST EA.
Bench, Woodwork								
Woodworking	54" x 64"-32¼" high,	Broadhead & Garrett (L-4)	2					235.00
Locker type, 12 lockers								
Locker type, single station	29½" x 64" x 32¼" high	B & G L-5		2	1	2	1	117.00
Arc welder's	36" x 36" x 33½" high	B & G 4181		1				76.00
Gas welder's	36" x 36" x 33½" high	B & G 4181		1				58.00
Glue and Stain	24" x 60" x 30" high	B & G GS24	1					79.00
Molding	24 x 48 x 60" high	B & G MB 1		1				160.00
	Galvanized paneling	for molding bench		1				9.00
Sheet metal w/plates	40" x 96" x 32"	high B & G SM90		1				310.00
Work	30" x 72" long	Lyons No. 2525 (With shelves)					1	46.90
Cabinet, File, steel, 4 drawer w/lock, letter size		Cole #204	1					59.35
Storage, steel, 36 x 24 x 78" high		B & G 160	1	1				79.95
Negative and plate storage	17 x 22"	Richmond (25 Drawer)					1	190.00
Furniture		Hamilton #1115					1	67.00
(Comes complete with furniture font-280 pieces)								
Type		Hamilton Model 111 (Full size w/cases)					2	317.00
Chair, Instructor's		B & G #747	1					62.50
Desk, Instructor's	30" x 60" x 29" high	Lyons 900	1					118.10
Stool, Steel, square seat	14" top x 22" high	Lyons 1750	20					4.35
Table, Plate finishing	22" x 26"	NuArc Globeline					1	190.00
Light	30" x 40"	NuArc Model LT-42					1	175.00
Line-up	Floor model	NuArc Model RR-26					1	495.00
Imposing	20" x 36"	Hamilton					1	87.50
Station, Demostration, Fuseless		Lab Volt Model 205P		1				695.00
Camera,	Vertical 18"	Kenro Model V185					1	1,275.00
	Vacuum back and Vacuum pump for	Kenro Model V185					1	160.00
								$ 6776.75

SMALL ENGINES REQUIREMENTS

At least 6 small engines of both 2 and 4-cycle should be available. No brand names or prices will be listed since suppliers many times have special offers for educational institutions. At least 50.00 should be allowed for the purchase of these engines.

APPENDIX

GUIDE FOR DETERMINING SPACE NEEDS FOR SELECTED SHOP EQUIPMENT*

*Considerations for certain programs

A. Open space is needed to bring in equipment to be serviced. Four feet should be allowed as working space around each piece of equipment.

B. The local community should allow space for future expansion.

C. Due to local community or program needs-space should be allowed for specific activities or equipment that is not included in the following list.

Item and Specification	Machine and working space requirements per machine (sq. ft.)	Number of Machines	Space Needed
Balancing equipment, wheel	10 - 50		
Barshear, metal cutting	30		
Bench, Demonstration	40		
Bench, Electronic	140		
Bench, Glue and Stain	88		
Bench, Layout	90 - 125		
Bench, Molding	30		
Bench, Power Mechanics	90		
Bench, sheet metal w/plates	130		
Bench, Silk screening and bookbinding	80		
Bench, Woodworking	118		
Brake, Drum and Shoe Reconditioning	35		
Brake, sheet metal	40 - 90		
Cabinet, Type and Accessories	27		
Cabinet, tool 1-6 x 2-6	11		
Camera, Offset	33		

Item and Specification	Machine and working space requirements per machine (sq. ft.)	Number of Machines	Space Needed
Changer, Tire	60		
Compressor, air, electric 100 lb. max.	15		
Crane, engine lifting	50		
Cutter, Paper	48		
Cutting machine, oxy.	50		
Drill press, heavy duty	60		
Forge area (gas or coal)	200		
Grinder, edge tool, 1/3 H.P., 7"x 1" wheels	30		
Grinder, heavy duty, ½ - 1 H.P.	30		
Grinder, Valve and seat	25		
Grinder, w/mower sickle attachment	50		
Heat treatment equipment	50		
Hydraulic unit	60		
Jointer, woodworking	75		
Lathe, metal working	40 - 80		
Lathe, woodworking	25		
Maker, Plate	20		
Milling Machine	40 - 60		
Pittsburg lock machine	70 - 100		
Planer, thickness	140		
Press, Arbor	30		
Press, Cylinder	75		

Item and Specification	Machine and working space requirements per machine (sq. ft.)	Number of Machines	Space Needed
Press, Offset	75		
Press, Platen	60		
Press, Proof	25		
Racks, lumber	25 x 50		
Racks, metal	18 x 36		
Sander, abrasive disc	40		
Saw, Band, woodworking	50		
Saw, Circular	175		
Saw, Hack, electric	40		
Saw, radial arm	120		
Shaper	80 - 100		
Slip rolls	50		
Squaring shears	70		
Stands, Engine	65		
Steam cleaner	100		
Stone, Imposing	64		
Surface Grinder	70		
Table, Drawing	35		
Table, Light 2-10 x 3-8	33		
Tank, Cleaning (auto)	28		
Tester, Distributor	15		
Tester, Motor analyzer	15		
Valve Grinder and refacer	30		

Item and Specification	Machine and working space requirements per machine (sq. ft.)	Number of Machines	Space Needed
Welding, electric	50		
Welding, oxy-acetylene	50		
Welding, inert gas	50		

SUMMARY OF SPACE NEEDED

	Square feet Needed
1. Space for equipment	
2. Space for office, classroom and planning area	
3. Space for storage and finishing	
4. Open space for equipment to be serviced, construction projects, etc.	
5. Others (to meet local/program needs)	
Total area needed	